

when one takes into account the art cited in the latest Office Action.

Claim 1, which is now canceled, is based on the state of the art as known from U.S. Patent 4,198,318 (Stowell).

This reference states that the invention is based on:

a process for producing aluminum oxide beads in which an acid aluminum oxide sol or an acid aluminum oxide suspension having a viscosity of 10 to 500 mPa.s is produced and converted into droplets, said droplets are coagulated in an aqueous ammonia solution, and the gel beads thereby formed are aged, washed, dried and calcined.

The invention defined in the amended claims presented above, and previously in the above-mentioned claim 2, is concerned with the problem of manufacturing aluminum oxide spheroidal particles with optimum spherical shape and narrow grain spectrum, combined with suitable porosity and high resistance to fracture, as well as low detrition. This result is accomplished by the steps recited in the improvement clause in claim 9 which recites:

the improvement in which said hydrosol droplets are formed by passing said member of the group consisting of an acid aluminum oxide sol and an acid aluminum oxide suspension through a vibrating annular nozzle plate, which is vibrated at a frequency of 10 Hz to 20,000 Hz, said vibrating plate having several nozzles, pre-solidifying said droplets by blowing ammonia gas against them, and collecting the pre-solidified droplets in said aqueous ammonia solution.

When this part of claim 9 is compared with the cited art, it is clear that the references neither anticipate this process nor make it obvious.

U.S. Patent 4,347,200 (Bezzi) refers to a process and an apparatus for the production of microspheres, but there is no reference to aluminum oxide. According to Bezzi, a perforated, vibrating plate (3) fractionates the solution.

The drops pass through a conical chamber where they are contacted by a reactive gas. The gas flows out of a vertical gas distributor (B). As a result, the airstream is directed towards the drops from one side. This method, however, cannot insure that the drops are enveloped by the reactive gas so completely that the required pre-gelling takes place.

There is, as mentioned above, absolutely no reference to aluminum oxide spheres in Bezzi. Furthermore, there is no provision for either ammonia as a reactive gas nor an ammonia solution, into which the pre-gelled spheres fall.

In particular, there is no provision for the drops to be fractionated by a nozzle ring, whence the drops fall generally along a hollow cylinder casing, whose interior and exterior are ventilated with ammonia gas. This is the only way of insuring that the controlled air-flow pre-gells the drops sufficiently. In this regard, we refer the Examiner's attention to the disclosure at page 7, third paragraph. As explained there, when the drops fall into the ammonia, there is a tendency for them to form flakes. The pre-gelling with ammonia gas is carried out so as to pre-gel the drops, and enable them to retain the desired spherical shape when they fall into the ammonia solution. This combination of steps is not suggested in any way by the reference.

U.S. Patent 4,309,312 (Takumi) does not actually aim at a process for the production of aluminum oxide spheres. Instead, this reference deals with the composition of an initial solution in order to process aluminum oxide spheres. The gelatinization agent employed is hexamethylene-tetramine, which does not decompose until it reaches a high temperature. That is why the drops containing hexamethylene-tetramine must be passed through an oil bath.

Therefore, U.S. Patent 4,309,312 involves a state of the art which was already dealt with on page two of the present application. See the discussion of DE 29 42 768. It is an important feature of the present invention that it is not necessary to use the oil employed in the process of this reference.

U.S. Patent 4,179,408 (Sanchez) refers basically to the production of an aluminum sol. In addition, the hardening of aluminum oxide hydrosols already referred to in the introduction to the present application is described for the production of aluminum spheres. This is contained in the abstract beyond any doubt. There is no reference to the use of a ring nozzle, as in the present invention. The process involves passing the droplets into a column containing an upper layer of water-immiscible liquid and ammonia and a lower body containing an aqueous coagulating agent. This is quite different from the present process in which the droplets pass through a gaseous ammonia region and into an aqueous ammonia bath.

U.S. Patent 4,190,622 (Landis) relates to a known prill tower which is used for spraying melted urea, which then falls in the tower, hardening as it falls. To facilitate the solidification of the sprayed drops, two airstreams are created: a cocurrent airflow in the direction of fall and a countercurrent airflow at the base of the prill tower. The first is somewhat uncontrolled relative to the stream direction since the cocurrent flow is produced by drawing out air. This involves producing an air current flowing in the direction of fall by a draft fan located near the floor. This cannot provide a controlled airstream exposure to the droplets going from inside to outside.

Regarding the cocurrent airstream, another disadvantage is that it can overheat so that the hardening required does not occur. For this reason the countercurrent airflow at the base must also be produced. The cocurrent and countercurrent flows are then drawn off by an annulus.

Using the spray and dry method hardening is a slow process. As the drawing shows, the drops fall onto a funnel shaped insert which causes them to be flattened into a lenticular shape, because, in this location, solidification cannot yet have taken place. Otherwise the introduction of a cool countercurrent would be unnecessary. This, of course, is quite different from the present process in which the droplets fall through a gaseous ammonia zone and fall into an aqueous ammonia bath, optionally with a layer of foam on the surface.

The prill tower is in fact a cooling tower which can also be recognized by its height. Thus, according to column 3, line 33, it has a height of 50 meters. By contrast, the process of the present invention features a controlled current of ammonia gas over a distance in the centimeter range. Thus in Example 1, a fall of 5 cm is disclosed.

Furthermore the process according to U.S. Patent 4,190,622 does not feature a vibrating nozzle.

U.S. Patent 2,968,833 (DeHaven) refers to a process for producing drops from a molten material. It involves hardening in a purely physical sense and producing spheres. In contrast to that, the present invention's process provides for droplets to be formed physically and the aluminum oxide spheres to be hardened chemically.

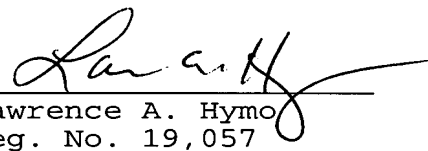
It may be true that the nozzles provided for spraying the molten material, in DeHaven, are located on a ring. But

there is no suggestion of drops falling along the circumference of a circle, exposed from inside and outside to a stream of gas, intended to cause a chemical reaction, i.e. pregelling.

A comparison between the present invention and the cited references shows that the references do not contain a conceptual basis for the present invention.

For these reasons, it is submitted that the claims are patentable, and in proper form, and that they should be allowed. Therefore, favorable reconsideration is respectfully requested.

Respectfully submitted,  
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